crossing the yarn guide element 11; instead, the yarn 2 keeps its flattened form along the short distance to the yarn inlet region 24. The cone angle of the yarn inlet region 24 is dimensioned as so steep that the yarn inlet face is approximately parallel to the incoming yarn, or forms a very acute angle with it. The surface of the yarn inlet region leaves the yarn in its somewhat fanned-out state, so that the yarn runs, lying flat, over the yarn inlet region and arrives standing practically upright in the yarn storage region 26. At the transition, it is deflected 90 by the transitional regions 33; because it is introduced into the package in this way, the yarn also creates space for itself, or in other words axially displaces the package, if such displacement requires a relatively strong force. Thus the yarn 2 wound up by the rotating yarn feed wheel 17 is converted into the package lying on the bearing faces 26; the individual windings each follow a polygonal course, and the winding upon each revolution of the yarn feed wheel 17 executes an axial migration by a distance equivalent to the thickness of the yarn.

The yarn 2 travels with more or less high tension to the textile machine, which continuously takes up the yarn. In the process, the yarn separates from the package and travels obliquely over the yarn payout region 36 to the yarn eyelets 14, 15 disposed below the yarn feed wheel 17, but at a radial spacing from its pivot axis D. Even if the yarn, under the tension of the outgoing yarn passing via the lowermost eyelets 14, 15 is still separated from the package in the yarn storage region 26, the yarn rests on top of the bearing faces 25. Without lifting away from the bearing faces 25, the yarn is transferred via the transitional regions 37 to the payout region 36, which its sweeps over.

As an alternative to the embodiment described above, the wall of the yarn feed wheel 17 between the bearing regions 25 can be embodied rectilinearly, so that the yarn rests loosely on these wall regions, or in other words without any wall pressure. In this embodiment, the advantages of the merely striplike yarn contact in the bearing regions 25 is combined with the advantages of the uninterrupted yarn contact and as a result it is no problem to keep the yarn feed wheel 17 clean and to eliminate deposits.

The yarn feed wheel 17 described above is made in one piece of ceramic or a comparable yard material. This produces very good wear resistance.

As FIGS. 11–17 show, the yarn feed wheel may also be formed of a sheet-metal shaped part or metal part which is coated on its outside with a hard material coating, such as ceramic, sapphire, a nitride (for instance, titanium nitride) a carbide, a metal hard substance layer, or boride. If needed, it may also be provided with a coating containing diamond other hard crystals, such as a nickel coating containing a fine diamond powder. A quartz or enamel coating is also possible. In contrast to layers that grow on a base material such as aluminum, and thus in part grow into the base material by chemical conversion thereof, as is the case in electrolytic formation of aluminum oxide layers (anodizing), this involves layers that are applied to the base body. An exception is the sapphire layer, which besides oxygen and silicon can also contain some aluminum of the base material. Base body contours can be rounded somewhat as needed, which can be useful for yarn travel. The choice of the coating can also be made from standpoints pertaining to yarn transport, without being limited to certain surface treatment techniques.

The geometry differs substantially from the wall thickness. The yarn feed wheel 17 made entirely of ceramic or a comparable hard substance has a relatively great wall thickness, while conversely the yarn feed wheel 17 of FIGS. 11–17 formed of a shaped sheet-metal part makes do with a less wall thickness. The yarn feed wheel 17 seen in FIG. 11 is hollow and is closed on its lower face end with a wall 41, whose central portion 42 forms a hub for securing it to a shaft. Instead of the conical region seen in FIG. 6, a cylindrical region 43 may be provided, in order to offset the central region 42 axially toward the end wall 41. With respect to the outer contour, the yarn feed wheel of FIGS. 11–17 matches that described above, however, to the extent that where the same reference numerals are used, the description applies accordingly.

The essential difference is in production. While a yarn feed wheel of ceramic is first pre-shaped and then fired, the yarn feed wheel 17 of FIGS. 11–17 can be made by shaping from a metal blank. After that, it should be provided with a coating as needed.

A yarn feeder 1 has a yarn feed wheel which preferably comprises ceramic or a hard substance or is coated with ceramic, sapphire, quartz, enamel, nitride, carbide, or a diamond-containing coating. Because of the choice of its material or its shaping, the yarn feed wheel has improved long-term operational properties. The geometry and/or the material is less susceptible to wear. This is attained by means of ceramic surfaces and/or the combination of a conical, continuous yarn inlet surface 24 with adjoining striplike bearing faces 25 in the yarn storage region 26 and a continuous, that is, uninterrupted surface in the yarn payout region; the surfaces are shaped such that the yarn, along its way from the inlet region into the payout region, sweeps over the corresponding surfaces 24, 25, 36 over the entire axial course. The striplike supporting or bearing of the yarn 2 in the yarn storage region is attained by suitable shaping of the yarn feed wheel 17 in the yarn storage region. Openings or slits or the like in the yarn feed wheel are not necessary but may be provided.

What is claimed is:

1. A yarn feeder for positive feeding of yarns comprising:

a yarn feed wheel that is rotatably supported about a pivot axis on a carrier, a drive mechanism for rotatably driving the yarn feed wheel, said yarn feed wheel comprising a single piece that includes a laterally extending yarn inlet region, a laterally extending yarn storage region, and a laterally extending yarn payout region,

said yarn inlet region having a circular cross section at each lateral point that is concentric to the pivot axis with a diameter which decreases along the pivot axis in a lateral direction toward the storage region,

said yarn payout region having a circular cross section at each lateral point that is concentric to the pivot axis with a diameter which increases along the pivot axis in a lateral direction away from the storage region,

said storage region having contact regions for the yarn that are spaced apart from one another,

said contact regions of the storage region of the yarn feed wheel each having a cross section which at least in some portions deviates from a circle that is concentric with the pivot axis, and

said yarn inlet region, yarn storage region, and yarn payout region merge with one another without shoulders or steps which can impede lateral movement of yarn from the inlet region to the storage region and from the storage region to the outlet region.

2. The yarn feeder of claim 1, wherein the yarn inlet region of the yarn feed wheel comprises a closed surface.

3. The yarn feeder of claim 1, wherein the yarn inlet region of the yarn feed wheel forms an angle with the pivot axis that is greater than 60°.

4. The yarn feeder of claim 1, wherein the yarn payout region of the yarn feed wheel comprises a closed surface.

5. The yarn feeder of claim 4, wherein the yarn payout region of the yarn feed wheel is embodied as a closed conical surface with a circular conical contour whose radius of curvature is shorter than the radius of the yarn feed wheel.

6. The yarn feeder of claim 4, wherein the yarn payout region of the yarn feed wheel is embodied as a curved surfaced located on a torus, whose radius of curvature is shorter than the radius of the yarn feed wheel.

7. The yarn feeder of claim 1, wherein the storage region disposed between the yarn inlet region and the yarn payout region has a substantially closed surface configuration.

8. The yarn feeder of claim 1, wherein the storage region has a polygonal cross section concentric with the pivot axis at every point, and the polygon defined by the cross section of the storage region has straight edges.

9. The yarn feeder of claim 1, wherein the storage region has a polygonal cross section concentric with the pivot axis at every point, and the polygon defined by the cross section of the storage region has non-straight edges.

10. The yarn feeder of claim 1, wherein the cross section of the storage region is defined radially on the outside by rounded bearing regions, between which the outer surface of the storage region extends radially inward, and convex surface regions are formed between adjacent bearing regions.

11. The yarn feeder of claim 1, wherein the cross section of the storage region is defined radially on the outside by rounded bearing regions, between which the outer surface of the storage region extends radially inward.

12. The yarn feeder of claim 1, wherein the cross section of the storage region is defined radially on the outside by rounded bearing regions, between which the outer surface of the storage region extends radially inward, and planar surface regions are formed between adjacent bearing regions.

13. The yarn feeder of claim 1, wherein the yarn feed wheel has a base body comprising ceramic, sapphire, quartz, diamond-containing material, nitride or carbide.

14. The yarn feeder of claim 1, wherein the yarn feed wheel has a base body coated with enamel, ceramic, sapphire, quartz, diamond-containing material, nitride or carbide.

15. The yarn feeder of claim 1, wherein the yarn feed wheel has a base body comprising metal.

16. The yarn feeder of claim 15, wherein said metal base body has a coating containing oxygen and a further component different from the base material.

17. The yarn feeder of claim 1, wherein the yarn feed wheel has an end wall on the one side that is provided with a central bore, with which the yarn feed wheel is received by a shaft.

* * * * *

18. The yarn feeder of claim 1 in which said yarn feed wheel comprises a one-piece body that is deep drawn and shaped from a metal blank so that walls of said inlet, storage and payout regions each have a thin wall thickness no greater than the thickness of the blank from which the body is formed.

19. The yarn feeder of claim 18 in which said inlet, storage, and payout regions each have a substantially uniform wall thickness.

20. The yarn feed wheel of claim 18 in which walls of said inlet, storage, and payout regions each have a wall thickness that is less than 1/32nd a diameter of said storage region.

21. A yarn feeder machine comprising a rotably mounted yarn feed wheel for positively feeding yarn through the machine, a drive mechanism for rotatably driving said yarn feed wheel, said yarn feed wheel comprising a one-piece body that includes a laterally extending yarn inlet region, a laterally extending yarn storage region having a diameter less than the inlet region about which yarn is wound, and a laterally extending yarn payout region; said yarn inlet region having a shape that decreases in a lateral direction toward the storage region; said payout region extending in a lateral direction away from said storage region such that yarn wound onto the wheel can laterally progress from the yarn inlet region, across the yarn storage region, and away from said yarn payout region; said yarn inlet region, yarn storage region, and payout region merge smoothly with one another without shoulders, steps, or interruptions which can impede lateral movement of yarn from

the inlet region to the storage region and from the storage region to the outlet region; and said body being deep drawn and shaped from a metal blank so that walls of said inlet, storage, and payout regions have a thin thickness no greater than the thickness of the blank from which the body is formed.

22. The yarn feeder machine of claim 21 in which said inlet, storage, and payout regions each have a substantially uniform wall thickness.

23. The yarn feeder machine of claim 21 in which walls of said inlet, storage, and payout regions have a thickness less than 1/32nd the diameter of said storage region.

24. The yarn feeder of claim 23 in which the diameter of said yarn storage region is defined by the outer perimeter of a plurality of circumferentially spaced ribs.

25. The yarn feeder of claim 21 in which said yarn feed wheel has an outer protective coating.

26. The yarn wheel of claim 25 in which said outer coating is enamel, ceramic, sapphire, quartz, diamond-containing material, nitride or carbide.

27. The yarn feed wheel of claim 21 in which said body is formed of aluminum.

28. The yarn wheel of claim 21 in which said yarn inlet region has a circular cross section at each lateral point, and said yarn payout region has a circular cross section at each lateral point.

29. A yarn feeder machine comprising a rotably mounted yarn feed wheel for positively feeding yarn through the machine, a drive mechanism for rotatably driving said yarn feed wheel, said yarn feed wheel comprising a one-piece body that includes a laterally extending yarn inlet region, a laterally extending yarn storage region having a diameter less than the inlet region about which yarn is wound, and a laterally extending yarn payout region; said yarn inlet region having a shape that decreases in a lateral direction toward the storage region; said payout region extending in a lateral direction away from said storage region such that yarn wound onto the wheel can laterally progress from the yarn inlet region, across the yarn storage region, and away from said yarn payout region; said yarn inlet region, yarn storage region, and payout region merge smoothly with one another without shoulders, steps, or interruptions which can impede lateral movement of yarn from the inlet region to the storage region and from the storage region to the outlet region; and said body being deep drawn and shaped from a metal blank so that walls of said inlet, storage, and payout regions have a thickness less than 1/32nd the diameter of the storage region.

30. The yarn feeder of claim 29 in which said yarn feed wheel has an outer protective coating of enamel, ceramic, sapphire, quartz, diamond-containing material, nitride or carbide.

31. The yarn wheel of claim 29 in which said yarn inlet region has a circular cross section at each lateral point, and said yarn payout region has a circular cross section at each lateral point.

32. A method of making a yarn feed wheel comprising the steps of providing a metal blank, and deep drawing the metal blank in one or more shaping steps to form a one-piece metal body that includes a yarn inlet region, a laterally extending yarn storage region having a diameter less than the diameter of said inlet region about which yarn can be wound, and a laterally extending yarn payout region with walls of said regions having a thin thickness no greater than the thickness of the metal blank from which the body is formed which merge smoothly without shoulders, steps or interruptions which can impede lateral movement of yarn from the inlet region to the storage region and from the storage region from the storage outlet region.

33. The method of claim 32 including deep drawing the metal blank to form said regions with a substantially uniform wall thickness.

34. The method of claim 32 including coating said one-piece metal body after said shaping steps.

35. The method of claim 33 including providing a metal blank made of aluminum.

36. The method of claim 35 including coating said metal body with enamel, ceramic, sapphire, quartz, diamond-containing material, nitrate or carbide.

37. A method of making a yarn feed wheel comprising the steps of providing a metal blank, and deep drawing the metal blank in one or more shaping steps to form a one-piece metal body that includes a yarn inlet region, a laterally extending yarn storage region having a diameter less than the diameter of said inlet region about which yarn can be wound, and a laterally extending yarn payout region with walls of said regions having a substantially uniform thin thickness less than 1/32nd the diameter of the storage region which merge smoothly without shoulders, steps or interruptions which can impede lateral movement of yarn from the inlet region to the storage region and from the storage region from the storage outlet region.

38. The method of claim 37 in which said walls of said inlet, storage and payout regions are formed with a substantially uniform thickness.

39. The method of claim 38 including coating said metal body with enamel, ceramic, sapphire, quartz, diamond-containing material, nitrate or carbide.